

essential grip on the quality of care rendered by the health care enterprise to the people of the nation. This will probably not be easy, but it must be accomplished. It far overshadows in importance the hoped for benefits, to both patients and public, of yet more competition.

—MSMW

Helmets for Motorcyclists

IN THIS MONTH'S ISSUE, Luna and his co-workers have documented the efficacy of wearing a helmet while riding a motorcycle. Of the various trauma prevention programs, mandatory helmet usage is among the least difficult to implement and carry out. For example, when compared with such other approaches as handgun control, removing drunk drivers from the highways or legalization of drugs, it is uncomplicated and easy.

In 1967 a federal highway safety standard required that all states enact and enforce mandatory helmet laws. In 1976 Congress passed a law revoking federal sanctions against states not complying with the helmet standard. During the time the sanctions were in force (1965 to 1976) the number of fatalities per 10,000 motorcycles fell from 12.8 to 6.5. Between 1976 and 1979, there were 27 states that either repealed or substantially weakened their helmet use laws. This resulted in a 46 percent increase in total motorcycle deaths.

In a study done in California by Harry Hurt,¹ 60 percent of motorcycle riders were not wearing safety helmets at the time of their crashes. Of this group, 26 percent said they did not wear helmets because they were uncomfortable and inconvenient and 53 percent had no expectation of crash involvement. Of those sustaining head injuries, 14 percent were wearing helmets at the time of the crashes; 23 percent of the fatally injured riders were wearing helmets but only 1 helmeted rider died of head injuries. Hurt concluded that the use of a safety helmet is the single most critical factor in the prevention or reduction of head injury.

In a study of 71 motorcyclists admitted to Denver General Hospital² only 38 percent were covered by commercial insurance or workers' compensation. It was found that 59 percent of the unpaid bills were borne by taxpayers. The Maryland Institute for Emergency Medical Services³ carried out a study involving 65 patients. Of these patients, 40 percent did not pay their bills; the bills averaged \$11,038. Twenty-five percent were

uninsured and the combined unpaid bills amounted to \$433,200, all of which had to be absorbed by taxpayers.

Motorcycle helmet opponents argue that helmets reduce peripheral vision and thus contribute to crash risks. Studies done by the National Highway Traffic Safety Administration showed that peripheral vision was found to be restricted in less than 3 percent of currently available helmets. The same opponents argue that helmets make it difficult for cyclists to hear. In the study done by Hurt, helmets did not lower the cyclists' ability to distinguish critical traffic sounds. Helmets are said to contribute to neck injuries. In the California study only 4 of the 980 head and neck injuries were attributed to safety helmets.

The data supporting the use of safety helmets by motorcyclists seem overwhelming. Clearly, helmets reduce death and head injuries. For those who continue to oppose mandatory motorcycle helmet laws a fundamental question must be answered: When do societal rights become more important than individual rights? The answer seems self-evident.

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Noninvasive Methods for the Study of Patients With Coronary Heart Disease

ELSEWHERE IN THIS ISSUE, Dr. Victor F. Froelicher has assembled reports on recent advances and current status of new noninvasive methods of evaluating patients with coronary heart disease. Motivation for these developments, which often provide less precision of anatomical details, is the alleged risk of vascular and cardiac complications induced by catheterization techniques. To put this into perspective, and disregarding the ever increasing financial costs of all methods, there is a small but definite clinical cost of two to three fatalities per thousand patients studied invasively with use of nonoxygenated, hyperosmolar contrast media to obtain visualization of morphologic de-

tails, particularly in high-risk, severely ischemic patients with heart disease. Morbidity from thrombosis requiring surgical treatment, hematoma from bleeding at arteriostomy or venostomy sites, and other less frequent miscellaneous complications such as microembolism to the cerebral or retinal circulations, are no less frequent problems. Thus, there is justification for continued research efforts to develop and eventually to substitute non-invasive methods, but the clinical justification to rely on them varies with value judgment of cost-effectiveness. Assessment of these aspects emerges slowly from the continued progress of many investigators employing diverse methods.

The salient clinical advantages, for these purposes, of electrocardiography (ECG) are cited by Dr. Ary Goldberger. In addition to the known strengths and weaknesses of conventional "low frequency" electrocardiography, he offers some observations about the correlations with inverted anterior T waves, which normalize with acute ischemia or persist in the presence of severe regional vascular stenosis and abnormal wall motion by ventriculography. In the former instance the potential contribution of posterior wall ischemia in the presence of inferior T wave inversion in the illustration, is neglected. Several causes of non-infarct-induced Q waves are cited to emphasize the limitations of this hallmark of infarction. Likewise other causes of ST elevation and T wave inversion are cited. Accordingly the need for consideration of all pertinent clinical information is properly emphasized before reliable interpretations of ECG changes may be derived. With improved technology, high frequency ECG information is also available, but the information described is meager and does not reflect prior contributions of other investigators. The substantial change in late as well as early depolarization of the ventricle with inferior infarction has been previously reported.

Dr. Tubau describes clinical experience at the Montreal Heart Institute with multichannel (14 leads) ECG recordings of exercise tests. All tests *were*, rather than *had to be*, considered maximal by exceeding at least 85 percent of the age-predicted maximal heart rate when the Bruce protocol for such testing was arbitrarily and (in the opinion of this reviewer) inadvisably modified. Interpretation of responses to exercise in 87 patients with angina reflects obsolete classification of "positive" versus "negative" responses with respect to ST depression but reveals awareness of

the importance of disease prevalence in various subgroups of patients and inadequacy of left ventricular function as appraised by duration of such exertion. Formulation of posttest *risk* (relative certainty or clinical confidence in diagnosis?) as product of prevalence of disease and likelihood ratio represents a more sophisticated assessment, albeit limited by the major preoccupation with ST depression, without consideration of its major determinants, namely cardiac dimensions and pressure-rate product. Yet the study is consistent with various observations that some system for multiple leads, either in graphic arrays (or, alternatively, electrically synthesized with spatial orientation) provides more useful information. The majority of 118 patients with previous myocardial infarction had multivessel coronary artery disease. Abnormal ECG responses identified from 80 percent to 96 percent of patients, in proportion to severity of symptoms with inferior infarction and multivessel disease; exercise testing was more useful in those with minimal symptoms. Somewhat lower yields were obtained in patients with previous anterior infarcts. ST elevation did not augment sensitivity of test response; this stands in contrast to other data indicating a poor prognosis for survival without subsequent cardiac events. This does not emerge from a study based solely upon immediate diagnostic correlations with arteriography. The conclusions of the author are valid but unfortunately disregard other equally available, and at less expense, blood pressure responses to exercise testing.

Advantages and limitations of M-mode echocardiography are cited by Dr. Costello. Multiple axis, two-dimensional echocardiographic techniques have greatly extended evaluation of size and mobility of cardiac chambers, walls and valves in the patient at rest. Ejection fractions are more reliably appraised than left ventricular volumes in systole and diastole because of tangential viewing and underestimation of circumference. Of greater interest, regional wall contraction abnormalities and pseudoaneurysms may be detected. Serial observations of acute infarction indicate the prognostic importance of cardiac dilatation. Even septal perforation and papillary muscle rupture have been detected; possible reliable assessment of stenosis of left main coronary arteries will emerge also.

Unfortunately accurate echocardiographic displays in response to the stress of strenuous exer-

cise, where the need for such assessment is substantial, is limited by the associated hyperpnea and mobility of the patient under such circumstances.

These needs are approached by use of two radionuclide imaging techniques discussed by Dr. Tubau. First, the time activity curve of the first pass of a radionuclide bolus through the left ventricle permits assessment of ejection fraction from the average end-diastolic and end-systolic counts for a few successive heart beats. This estimate correlates with that of biplane ventriculography. Superimposing images of short duration from successive heart beats provides an approximation to ventricular volumes and therefore estimation of changes in volumes with the heart cycle. Such estimates permit derivation of cardiac output similar to those obtained by indicator dilution methods. Output may also be estimated from the first pass of the radionuclide by integration of the gamma camera image of the heart.

Another and more accurate radionuclide technique is use of a stable radionuclide such as technetium 99m linked to albumin or red blood cells that remains in the circulation for a few hours. This requires counting of 300 or more successive heart beats for each assessment, but this evaluation may be repeated periodically for several intervals. Despite assumptions about adequacy of normalization of the left ventricular counts, of rate of radioactive decay and of attenuation as influenced by various tissue factors and distance from the gamma camera, continuing efforts are made to estimate ventricular volumes and therefore cardiac output. Because of established differences with contrast ventriculographic volumes correction factors are needed. Experience to date seems to emphasize limitations rather than advantages, although relative changes in volumes needed for

ejection fraction are more likely to be representative.

These reviews would be more helpful if emphasis were placed on how these methods improve the clinical decision-making processes. Yet the concluding remarks of the conference coordinator reflect a contemporary clinical assessment. Another method, namely that of thallium imaging to assess dynamic changes in myocardial perfusion due to ischemia is not assessed. Guidelines regarding optimal utilization in terms of clinical indications would be useful to referring physicians. Perhaps a similar review in another decade will include the advantages and limitations of positron emission tomography, which offers the potential, albeit at considerable equipment and technological expense, of evaluating left ventricular function, coronary blood flow and myocardial metabolism globally and regionally by other radionuclide imaging techniques.

Meanwhile for physicians concerned about more predictive assessment of risks of primary or secondary events due to coronary heart disease in middle-aged ambulatory men observed in routine clinical office practice, insights from the recently published noninvasive exercise studies of the Seattle Heart Watch offer considerable promise at minimal expense.¹⁻⁴

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